Name:

at1117paper: Complete the Square (v324)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 56 feet. Their combined area, found by adding the square's area and the rectangle's area, is 585 square feet. What is the value of x?

Example's Solution

$$x^2 + 56x = 585$$

To complete the square, add $\left(\frac{56}{2}\right)^2 = 784$ to both sides.

$$x^2 + 56x + 784 = 1369$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 28)^2 = 1369$$

Undo the squaring.

$$x + 28 = \pm\sqrt{1369}$$

$$x + 28 = \pm 37$$

Subtract 28 from both sides.

$$x = -28 \pm 37$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 9$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 52 feet. The total area, of the square and rectangle, is 1440 square feet. What is the value of x?

$$x^2 + 52x = 1440$$

$$x^2 + 52x + 676 = 2116$$

$$(x + 26)^2 = 2116$$

$$x + 26 = \pm 46$$

$$x = 20$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 46 feet. The total area, of the square and rectangle, is 495 square feet. What is the value of x?

$$x^2 + 46x = 495$$
$$x^2 + 46x + 529 = 1024$$
$$(x + 23)^2 = 1024$$
$$x + 23 = \pm 32$$
$$x = 9$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 24 feet. The total area, of the square and rectangle, is 180 square feet. What is the value of x?

$$x^2 + 24x = 180$$
$$x^2 + 24x + 144 = 324$$
$$(x + 12)^2 = 324$$
$$x + 12 = \pm 18$$
$$x = 6$$